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(54) OPTICAL INFORMATION RECORDING MEDIUM AND ITS MANUFACTURING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an optical information recording medium for eliminating necessity of an initializing process without re-designing a recording layer composition in the medium having a metastable Sb3Te phase belonging to a space group Fm3m in the medium having a phase change recording material having Sb and Te as a recording layer.
SOLUTION: The optical information recording medium comprises the recording layer and a crystallization accelerating layer contacted with at least a part of the recording layer and made of a Bi compound having a high melting point.

[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1]In an optical information recording medium which has a metastable Sb_3Te phase to which it is an optical information recording medium which uses as a recording layer a phase change recording material which has Sb and Te, and this recording layer belongs to space group Fm3m, An optical information recording medium having touched this at least a part of recording layer, and providing a crystallization promoting layer which consists of a Bi compound of a high-melting point.

[Claim 2]An optical information recording medium characterized by the melting point of Bi compound being not less than 700 ** in the optical information recording medium according to claim 1.

[Claim 3]An optical information recording medium, wherein a crystallization promoting layer does not fuse in any at the time of record, elimination, and reproduction in the optical information recording medium according to claim 1 or 2.

[Claim 4]An optical information recording medium, wherein a crystallization promoting layer consists of a compound of Bi and Ce in the optical information recording medium according to claim 1, 2, or 3.

[Claim 5]An optical information recording medium, wherein a crystallization promoting layer consists of a compound of Bi and Zr in the optical information recording medium according to claim 1, 2, or 3.

[Claim 6]An optical information recording medium characterized by thickness of a crystallization promoting layer being 0.2-5.0 nm in the optical information recording medium according to claim 1, 2, 3, 4, or 5.

[Claim 7]In the optical information recording medium according to claim 1, 2, 3, 4, 5, or 6, An optical information recording medium characterized by coming to add at least one of the elements chosen as this recording layer from a group Ib element, a group II element, group III elements, an IV group element, V group element, a VI group element, a rare earth element, and a transition metal element.

[Claim 8]An optical information recording medium characterized by this IV group element being germanium in the optical information recording medium according to claim 7.

[Claim 9]A manufacturing method of an optical information recording medium producing a crystallization promoting layer in an optical information recording medium of claim 1 thru/or 8 given in any 1 paragraph on a substrate in order of the 1st dielectric layer, a crystallization promoting layer, and a recording layer.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention about an optical information recording medium in more detail, It is a rewritable phase change type optical information recording medium used as media, such as CD-RW, DVD-RAM, -RW, and +RW, and is related with an optical information recording medium which has a recording layer which has a metastable Sb_3Te phase belonging to space group Fm3m, and a manufacturing method for the same.
[0002]
[Description of the Prior Art]The commercialization as media, such as phase change CD-RW which used the reversible phase change of a crystallized state and an amorphous (amorphous) state by laser beam exposure as an optical information recording medium in which record of information, reproduction, and elimination are possible, DVD-RAM, -RW, and +RW, is expected.
[0003]Research and development are furthered about what comprised a recording layer which has a metastable Sb_3Te phase to which a recording layer belongs to space group Fm3m among the above-mentioned phase change type optical information recording media (Japanese Patent Application No. No. 217069 [ten to] etc.). This metastable phase differs from the recording layer of Sb-Te eutectic crystal structure, it does not separate into Sb and Sb_2Te_3, and disorder of the recording mark resulting from the grain boundary is not produced, either. Therefore, the thing using the recording layer which has a metastable Sb_3Te phase belonging to space group Fm3m has the strong point whose high density recording becomes possible. Repeatedly, since it is strong to the thermal shock at the time of record, the recording layer which has this metastable Sb_3Te phase has the outstanding repetition recording characteristic.
[0004]By the way, in the phase change type optical information recording medium using the recording layer which has the above-mentioned metastable Sb_3Te phase, a recording layer is produced by the vacuum producing-film methods, such as sputtering and vacuum evaporation, and the film immediately after film production has usually become an amorphous state. On the other hand, the recording layer of the optical information recording medium produced commercially must be a crystallized state. In the erasable light information record carrier using a phase transition, it is because record film is set as an amorphous state by a recorded state and is generally set as a crystallized state in the state of elimination (initialization).For this reason, the initialization process which heat-treats a laser beam exposure etc. and crystallizes a recording layer immediately after film production of a recording layer was required.
[0005]However, since the time for 30 seconds or more is required for the above-mentioned initialization process, in mass-producing by downing a throughput, it is [many devices for an initialization process / stand] necessary, and an installation cost not only becomes expensive, but they cause the rise of product cost.
[0006]Making it crystallize, after a recording layer's producing a film, and making an initializing step unnecessary by that cause from such a thing, by providing the crystallization promoting layer which consists of Bi or its compound in contact with at least a part of recording layer, was proposed (Japanese Patent Application No. No. 266970 [11 to]).
[0007]
[Problem(s) to be Solved by the Invention]However, a presentation gap of a recording layer takes place and change produces a crystallization promoting layer in the disk characteristic in order to carry out melting mixing with a recording layer at the time of record and playback. In order to solve such a problem, it is necessary to perform the materials design in consideration of the mixture composition of a recording layer and a crystallization promoting layer but, and in order for redesign to take considerable development cost, it leads to the rise of product cost.
[0008]An object of this invention is to provide the phase change type optical information recording medium which makes an initialization process unnecessary and which does not cause a cost hike, without solving an above-mentioned problem and redesigning a recording layer presentation.
[0009]
[Means for Solving the Problem]An aforementioned problem of this invention is attained by the following means. In an optical information recording medium which has a metastable Sb_3Te phase to which according to this invention it is an optical information recording medium which uses as a recording layer a phase change recording material which has Sb and Te in claim 1, and this recording layer belongs to space group Fm3m in the first place, It is characterized [main] by having touched this at least a part of recording layer, and providing a crystallization promoting layer which consists of a Bi compound of a high-melting point.
[0010]By claim 2, it is characterized [second] by the melting point of Bi compound being not less than 700 ** in an optical information recording medium given in above-mentioned claim 1.
[0011]By claim 3, a crystallization promoting layer does not fuse [third] in any at the time of record, elimination, and reproduction in an optical information recording medium given in above-mentioned claim 1 or 2.
[0012]By claim 4, a crystallization promoting layer consists [fourth] of a compound of Bi and Ce in an optical information recording medium given in above-mentioned claim 1, 2, or 3.
[0013]By claim 5, a crystallization promoting layer consists [fifth] of a compound of Bi and Zr in an optical information recording medium given in above-mentioned claim 1, 2, or 3.
[0014]By claim 6, it is characterized [sixth] by thickness of a crystallization promoting layer being 0.2-5.0 nm in an optical information recording medium given in above-mentioned claim 1, 2, 3, 4, or 5.
[0015]In an optical information recording medium given in above-mentioned claim 1, 2, 3, 4, 5, or 6 in seventh claim 7, It comes to add at least one of the elements chosen as this recording layer from a group Ib element, a group II element, group III elements, an IV group element, V group element, a VI group element, a rare earth element, and a transition metal element.
[0016]By claim 8, it is characterized [eighth] by this IV group element being germanium in an optical information recording medium given in above-mentioned claim 7.
[0017]By claim 9, it is characterized [ninth] by a manufacturing method of an optical information recording medium which produces a crystallization promoting layer in an optical information recording medium of above-mentioned claim 1 thru/or 8 given in any 1 paragraph on a substrate in order of the 1st dielectric layer, a crystallization promoting layer, and a recording layer.
[0018]
[Embodiment of the Invention]Hereafter, this invention is explained in full detail. Although the optical information recording medium of this invention produces each above-mentioned film one by one by the vacuum producing-film method and is produced on a substrate, By having provided the crystallization promoting layer which consists of a Bi compound of a high-melting point in contact with at least a part of recording

layer, the recording layer which has the above-mentioned metastable Sb_3Te phase is crystallized after a film production process. In this invention, since the melting point of a crystallization promoting layer is high, a crystallization promoting layer does not fuse in any of record, reproduction, and elimination. Therefore, a crystallization promoting layer and a recording layer are not mixed and change of the disk characteristic by mixing does not break out. Thus, in this invention, the fault by being able to use the greatest crystallization facilitatory effect of Bi, and also a crystallization promoting layer carrying out melting mixing with a recording layer is also avoidable. Therefore, redesign of the recording layer material in consideration of the mixture composition of a recording layer and a crystallization promoting layer becomes unnecessary, and a medium can be provided more by low cost.

[0019]In this invention, as for the melting point of a crystallization promoting layer, in order not to fuse a crystallization promoting layer at the time of record, reproduction, and elimination, not less than 700 ** is desirable. The more it is high, the more it is hard to fuse, but if the melting point becomes high too much, production of a target becomes difficult and the melting point's is not preferred. Therefore, not less than 800 ** 1700 ** or less is not less than 1000 ** 1500 ** or less more preferably.

[0020]As a Bi compound of a high-melting point, Bi_2Ca_3 (melting point of 1200 **), $BiCe_3$ (1525 **), Bi_3Ce_4 (1630 **), BiCe (1400 **), Bi_2 Ce (883 **), BiIr (1420 **), $BiIr_2$ (1440 **), $BiLi_3$ (1145 **), Bi_2Mg_3 (823 **), BiMn (1095 **), BiRh (997 **), Bi_2 Rh (774 **), BiU, Bi_2Zr (714 **), BiZr (1302 **), Bi_2Zr_3 (1497 **), $BiZr_2$ (1342 **), $BiZr_3$ (1292 **), etc. are mentioned.

[0021]A compound with Zr and a compound with Ce are especially preferred. These two have many kinds of high-melting point compound compared with other compounds, and at the time of target production and sputtering, even if a presentation gap occurs, Bi (271 **) of a low melting point should not separate them easily. For example, when a presentation gap takes place in a direction with little Bi at the time of target production in Bi_2Zr_3, it may become a mixture of BiZr and $BiZr_2$, and a peritectic, but Bi of a low melting point does not separate. In addition to such a strong point, since the compound with Zr has cheap Zr as compared with the precious metals etc., and a compound is comparatively stable and target production is easy, material cost can be pressed down low.

[0022]Especially the compound with Ce has a large crystallization facilitatory effect, and very thin thickness also demonstrates a crystallization facilitatory effect. Since a crystallization facilitatory effect can use it from a large thing effectively also to the recording layer which is hard to crystallize, the effect as a promotion layer can be acquired to the recording layer of a wider composition range. Although the reason the crystallization facilitatory effect of a compound with Ce is large is not certain, the crystal structure of BiCe is a NaCl type and it is thought that it is because it belongs to the same Fm3m as a recording layer.

[0023]In this invention, a crystallization promoting layer may be provided in contact with the whole surface of a recording layer, and may be provided in contact with a part. May provide a crystallization promoting layer between the 1st dielectric layer and a recording layer, and, Although it may provide between a recording layer and the 2nd dielectric layer and may provide in the both, it is desirable to provide between the 1st dielectric layer and a recording layer from a viewpoint of effective exertion of a crystallization promotion operation and improvement in a throughput. A crystallization promoting layer may be a continuation film, it may be a discontinuous film of island shape, and both desired crystallization facilitatory effects are acquired. A crystallization promoting layer is formed by the vacuum producing-film methods, such as sputtering and vacuum evaporation. 0.2-20 nm of thickness [0.2-5.0 nm of] of a crystallization promoting layer is 0.5-2.0 nm still more preferably more preferably. As for the thickness of a crystallization promoting layer, it is desirable that it is 1 / 100 - 1/2 of recording layer thickness, and it is still more desirable that it is 1 / 50 - 1/10. A desired crystallization facilitatory effect is acquired as the thickness of a crystallization promoting layer is within the limits of the above, and the optical influence of a crystallization promoting layer can be disregarded, and offer of the medium where quality was stabilized is attained.

[0024]The recording layer which has a metastable Sb_3Te phase belonging to space group Fm3m is used for the recording layer of the optical information recording medium of this invention. And at least one of the elements chosen as this recording layer from a group Ib element, a group II element, group III elements, an IV group element, V group element, a VI group element, a rare earth element, and a transition metal element is added if needed [, such as improvement in preservation reliability, and improvement in a recording characteristic,]. An alloying element is a range which does not bar the appearance of the metastable Sb_3Te phase belonging to space group Fm3m, and the crystallization temperature of a recording layer can add it in the range which does not exceed 200 **. When which element is added, depending on the crystallization temperature of a recording layer, it is easy to crystallize the ease of carrying out of crystallization of a recording layer, so that crystallization temperature is low. Although it can ask for the crystallization temperature of a recording layer by thermometric analysis, since it stops crystallizing if crystallization temperature exceeds 200 ** when it thinks with the measured value for heating-rate/of 10 ** only by passing through a film production process, it is not preferred. Preferably, crystallization temperature is 140-185 ** more preferably, and can add 120 ** - 200 ** of the above-mentioned elements in this range.

[0025]In the above-mentioned element, germanium is an especially effective alloying element. Especially the effect of germanium of raising preservation reliability and a recording characteristic is remarkable. germanium may add only germanium independently and may add it with other elements. As such a recording layer, there are GeAgInSbTe added with GeSbTe, Ag, and In which added only germanium, GeInSbTe added with In, GeAgSbTe added with Ag, etc. by using Sb and Te as the main ingredients, for example. GeSbTe here differs from the $germanium_2Sb_2Te_5$ system of the compound system material known from the former. The $germanium_2Sb_2Te_5$ system known from the former to being a $GeTe-Sb_2Te_3$ system in this invention. It uses that an optical property changes in the phase transition between a Sb_3Te metastable phase and an amorphous phase to the last. Composition ranges also differ greatly.

[0026]10-100 nm of thickness [15-35 nm of] of a recording layer is 17-25 nm still more preferably more preferably. If thinner than 10 nm, optical absorption ability will fall and the function as a recording layer will be lost. Since the transmitted light decreases, it becomes impossible on the other hand, to expect cross protection, if thicker than 100 nm.

[0027]The example of composition of the optical information recording medium by this invention is shown in drawing 1. In a crystallization promoting layer and 4, a recording layer and 5 are [the 1st dielectric layer and 3 / the 2nd dielectric layer and 6] reflection radiation layers, and, as for 7, 1 is [a substrate and 2] the organic environmental protection layers (UV-curing-resin layer) provided on 6 if needed. Since explanation of the crystallization promoting layer 3 and the recording layer 4 was given in the above, the composition of other layers is explained below.

[0028]In this invention, as the 1st and 2nd dielectric layers (protective layer) 2 and 5, SiOx, ZnO, SnO_2, and $aluminum_2O_3$, TiO_2 and In_2O_3, MgO, ZrO_2, Carbide, such as sulfides, such as nitrides, such as metallic oxides, such as Ta_2O_5, Si_3N_4, AlN, TiN, BN, and ZrN, ZnS, and TaS_4, SiC, TaC, B_4C, WC, TiC, and ZrC, is mentioned. Such materials can be alone used as a protective layer, and can also be used as a mixture. For example, ZnS, SiOx, and Ta_2O_5 and SiOx are mentioned as a mixture. It is required that these materials physical properties have adhesion with thermal conductivity, specific heat, a coefficient of thermal expansion, a refractive index and a substrate material, or recording layer material, etc., are high, and are small, and adhesion is good. [of a coefficient of thermal expansion] [of the melting point] Especially the 2nd dielectric layer influences repetitive overwriting characteristics.

[0029]As for the thickness of the 1st dielectric layer 2, 75 nm - 200 nm are preferred as a range of 50-250 nm. If it becomes thinner than 50 nm, it becomes the fall of an environment-resistant protection feature, a heat-resistant fall, and the fall of ********, and is not desirable. in the film production process by a sputtering technique etc. on the other hand if it becomes thicker than 250 nm -- film temperature -- since film peeling and a crack occur by the rise of a degree or the fall of the sensitivity at the time of record is brought about, it is not desirable.

[0030]The thickness of the 2nd derivation body whorl 5 considers it as the range of 10 nm - 100 nm, and 15 nm - 50 nm are preferred. If thinner than 10 nm in the case of the 2nd dielectric layer, heat resistance falls fundamentally and it is not desirable. If 100 nm is exceeded, repetitive overwriting characteristics will worsen due to the fall of the film peeling by the fall of recording sensitivity, and a rise in heat, modification, and heat dissipation nature.

[0031]As the reflection radiation layer 6, the simple substance of a material centering on metal, such as aluminum, Au, Cu, Ag, Cr, Sn, Zn, In, Pd, Zr, Fe, Co, nickel, Si, germanium, Sb, Ta, W, Ti, and Pb, or an alloy, and a mixture can be used. The plural laminates of different metal, alloy, or mixture may be carried out if needed. It is important for this layer to miss heat efficiently, and thickness may be 30 nm - 250 nm. 50 nm - 150 nm are preferably good. When thickness is too thick, radiation efficiency is too good, when sensitivity worsens and is too thin, it is highly sensitive, but repetitive overwriting characteristics worsen. As the characteristic, thermal conductivity is high and it is required with a high-melting point that adhesion with the charge of a protective layer material should be good etc.
[0032]For example, record reproduction of the optical information recording medium by the material and composition which were described above can be carried out using the pickup of NA0.6 with a semiconductor laser (NA0.6 or 650 nm) with the semiconductor laser whose wavelength is 635 nm. As a record method, a modulation code can use EFM or an EFM+ [8 / 16RLL (2, 10)] method, for example by PulseWidth Modulation. In this case, a pulse is divided into the multi-pulse part of a leading pulse and after that. A multi-pulse part is for repeating heating and cooling and performing them.
[0033]In the above-mentioned case, the relation of each power serves as heating (record) power > erase power > cooling power, and cooling power is lowered to a read-out power grade. Read-out power is performed at 1 mW or less.
[0034](EXAMPLE) This invention is hereafter explained based on an example. In this example, membranes were formed with the sheet type sputter device which has five chambers. However, the number of chambers does not need to adhere to five pieces, and a production top is possible for it if it is five or more pieces. The items of each membrane formation are shown below.
Membrane-formation Room 1(following PC1 and brief sketch): $ZnS-SiO_2$ (the 1st dielectric layer)
Membrane-formation Room 2(following PC2 and brief sketch): Crystallization-promoting-layer membrane-formation room 3 (following PC3 and brief sketch): Recording layer membrane formation room 4(following PC4 and brief sketch):$ZnS-SiO_2$ (the 2nd dielectric layer)
Membrane-formation Room 5(following PC5 and brief sketch): aluminum (reflection radiation layer)
[0035]The polycarbonate board (120 mm in diameter and 0.6 mm in thickness) (a following PC board and a brief sketch) was produced by one to Examples 1-6 and comparative example 6 injection molding. By PC1, the $ZnS-SiO_2$ film was formed by the following conditions on this PC board at sputtering process.
Target material: SiO_2 (20.5-mol%), ZnS (79.5-mol%) supplied power:RF4kW/8 inch target gas pressure:2mTorr type-of-gas:Ar thickness:190nm
[0036]Next, the crystallization promoting layer (Table 1) was formed by the following conditions by PC2.
target material: -- Table 1 supplied power: -- DC0.4kW/8 inch target gas pressure: -- 2mTorr type-of-gas: -- Ar thickness: -- by 0.5 nm, 2.0 nm, 5.0 nm, next PC3. The recording layer (recording layer) which has a metastable Sb_3Te phase belonging to space group Fm3m which has the presentation mentioned to Table 1 by the following conditions was formed.
target material: -- alloy target (presentation is Table 1) supplied power: -- DC0.4kW/8 inch target gas pressure: -- 2mTorr type-of-gas: -- Ar thickness: -- it is 15 nm, next PC4 and the $ZnS-SiO_2$ film (the 2nd dielectric layer) was formed by sputtering process by the following conditions.
Target material: The Al film (reflection radiation layer) was formed by the following conditions by SiO_2 (20.5-mol%), ZnS (79.5-mol%) supplied power:RF4kW/8 inch target gas pressure:2mTorr type-of-gas:Ar thickness:20nm, next PC5.
target material: -- aluminum supplied power: -- DC5kW/8 inch target gas pressure: -- 2mTorr type-of-gas: -- Ar thickness: -- further 140 nm. After applying UV curing resin on the above-mentioned Al film at 3-micrometer thickness, it irradiated with UV light, the organic environmental protection layer was formed, and the phase-change optical disk by this invention was produced.
[0037]When reflectance was measured about Examples 1-6, all are not less than 18%, and the recording layer was crystallizing them without the initializing step. When the crystal structure of a recording layer is investigated with X-ray diffractometer, all belong to space group Fm3m. Next, when record reproduction of information was performed without performing an initialization process, record reproduction was able to be performed satisfactorily. A repetition recording characteristic and preservability reliability were also good. When the case where the usual laser initialization was performed without providing a crystallization promoting layer was compared with the initialization jitter, change was hardly seen. (x and jitter sigma/T [%] when it does not provide are set to y for the jitters sigma/T [%] when a crystallization promoting layer is provided, and it is delta=x-y. [%])
The ******** thing was shown in Table 1.
[0038]On the other hand, about the comparative examples 1-6, when reflectance was measured, all are not less than 18%, and the recording layer was crystallizing them without the initializing step, but when record reproduction of information was performed, jitter properties were getting worse as compared with the case where the usual laser initialization is performed without providing a crystallization promoting layer. In consideration of the mixture composition of a recording layer and a crystallization promoting layer, it turns out that recording layer material needs to be redesigned.
[0039]The above result shows that an initializing step can be made unnecessary by this invention by using a crystallization promoting layer as a high-melting point Bi compound with a melting point of not less than 700 **, without redesigning a recording layer.
[0040]When membrane formation is repeated when the target of another lot is used, deed target erosion advanced about Examples 1-4 and it was any, the fall of the jitter properties by it being changeless to delta and having provided the promotion layer was not seen. On the other hand, about Example 5, when the target of another lot was used, delta increased, and there was a case where jitter properties fell by having provided the crystallization promoting layer. About Example 6, when the target with which erosion advanced was used, delta increased and there was a case where jitter properties fell by having provided the crystallization promoting layer. Isolation of Bi according [each of these causes] to a presentation gap is considered to be the cause. As mentioned above, it turns out that the fall of jitter properties can be certainly prevented by using a compound with Zr, and a compound with Ce.
[0041]Example 7 crystallization promoting layer was set to BiCe. A recording layer shall be in the range whose crystallization temperature is 120 ** - 180 **, and produced the disk like Examples 1-6. When the reflectance of the disk was measured, all are not less than 18%, and the recording layer was crystallizing them without the initializing step. Record reproduction was able to be performed having no initialization process and satisfactorily. When the case where the usual laser initialization was performed without providing a crystallization promoting layer was compared with the initialization jitter, change was hardly seen.
[0042]Media were produced like Example 6 except having set comparative example 7 crystallization promoting layer to BiIr. When the reflectance of the disk was measured, the crystallization temperature of a recording layer is [each of 160 **] not less than 18%, and the recording layer was crystallizing without the initializing step, but reflectance became 18% or less and the initializing step was required for it at more than it. As mentioned above, by using a compound with Ce, also by a recording layer with high crystallization temperature, an initializing step is made as it is unnecessary. That is, it turns out that the range of an applicable recording layer presentation spreads.
[0043]
[Table 1]

	記録材料	記録促進層 材料（融点）	反射率 （%）	⊿ （%）
実施例 1	Ag3 In5 Sb65 Te27	BiZr(1302℃)	>18	0.2
実施例 2	Ag0.5 In4.5 Sb68 Te25 Ge2	Bi2Zr3(1497℃)	>18	0
実施例 3	In2 Sb68 Te27 Ge3	BiCe(1400℃)	>18	0.1
実施例 4	Sb69 Te25 Ge6	Bi2Zr(714℃)	>18	0.2
実施例 5	Ag3 In2 Sb68 Te25 V2	BiRh(997℃)	>18	0.1
実施例 6	Ag0.5 In4.5 Sb68 Te25 Ge2	BiLi3(1145℃)	>18	0.3
比較例 1	Ag3 In5 Sb65 Te27	Bi(271℃)	>18	1.2
比較例 2	Ag0.5 In4.5 Sb68 Te25 Ge2	Bi(271℃)	>18	1.3
比較例 3	In2 Sb68 Te27 Ge3	Bi(271℃)	>18	2.0
比較例 4	Sb69 Te25 Ge6	Bi2Te3(585℃)	>18	1.4
比較例 5	Ag3 In2 Sb68 Te25 V2	Bi2Te3(585℃)	>18	1.1
比較例 6	Ag0.5 In4.5 Sb68 Te25 Ge2	Bi2Te3(585℃)	>18	2.0

[0044]
[Effect of the Invention]As mentioned above, from having provided the crystallization promoting layer which consists of a Bi compound of a high-melting point in contact with at least a part of phase change recording layer which has a metastable Sb_3Te phase belonging to space group Fm3m according to the optical information recording medium of claim 1. A recording layer crystallizes immediately after film production, and the initialization process by heat treatment needed conventionally not only becomes unnecessary, but since the melting point of a crystallization promoting layer is high, in any at the time of record, elimination, and reproduction, a crystallization promoting layer does not carry out melting mixing with a recording layer. Therefore, change of the disk characteristic by presentation gap of a recording layer does not break out. As a result, an initializing step can be made unnecessary, without redesigning recording layer material.
[0045]According to the optical information recording medium of claim 2, since the melting point of the above-mentioned Bi compound considered it as not less than 700 **, a crystallization promoting layer cannot fuse in any of record, reproduction, and elimination, but melting mixing of a crystallization promoting layer and a recording layer can be avoided.
[0046]According to the optical information recording medium of claim 3, since a crystallization promoting layer does not fuse in any at the time of record, elimination, and reproduction, the fault by a crystallization promoting layer carrying out melting mixing with a recording layer is certainly avoidable.
[0047]Even if according to the optical information recording medium of claim 4 there should be many kinds of high-melting point compound compared with other compounds and a presentation gap should occur from a crystallization promoting layer being a compound of Bi and Ce at the time of target production and sputtering, it is hard to separate Bi (271 **) of a low melting point. Especially the compound with Ce has a large crystallization facilitatory effect, and very thin thickness also demonstrates a crystallization facilitatory effect. Since it can be effectively used from a crystallization facilitatory effect being still larger also to the recording layer which is hard to crystallize, the effect as a promotion layer can be acquired to the recording layer of a wider composition range.
[0048]According to the optical information recording medium of claim 5, since the crystallization promoting layer is a compound of Bi and Zr, when a presentation gap takes place in a direction with little Bi at the time of target production in Bi_2Zr_3, may become a mixture of BiZr and $BiZr_2$, and a peritectic, but. Bi of a low melting point does not separate. In addition to such a strong point, since the compound with Zr has cheap Zr as compared with the precious metals etc., and a compound is comparatively stable and target production is easy, material cost can be pressed down low.
[0049]According to the optical information recording medium of claim 6, since the thickness of a crystallization promoting layer is 0.2-5.0 nm, a desired crystallization facilitatory effect is acquired, and the optical influence of a crystallization promoting layer can be disregarded, and the recording medium where quality was stabilized can be provided.
[0050]According to the optical information recording medium of claim 7, to a recording layer A group Ib element, a group II element, From at least one of the elements chosen from group III elements, an IV group element, V group element, a VI group element, a rare earth element, and a transition metal element being added. Improvement in preservation reliability, improvement in a recording characteristic, etc. can be aimed at in the range which does not bar the appearance of the metastable Sb_3Te phase belonging to space group Fm3m and in which the crystallization temperature of a recording layer does not exceed 200 **.
[0051]According to the optical information recording medium of claim 8, since the above-mentioned IV group element is germanium, especially the effect of raising preservation reliability and a recording characteristic is remarkable.
[0052]According to the manufacturing method of the optical information recording medium of claim 9, since the above-mentioned crystallization promoting layer is produced between the 1st dielectric layer and a recording layer, a crystallization promotion operation can be demonstrated more effectively and a throughput can be raised.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention]This invention about an optical information recording medium in more detail, It is a rewritable phase change type optical information recording medium used as media, such as CD-RW, DVD-RAM, -RW, and +RW, and is related with an optical information recording medium which has a recording layer which has a metastable Sb_3Te phase belonging to space group Fm3m, and a manufacturing method for the same.

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PRIOR ART

[Description of the Prior Art]The commercialization as media, such as phase change CD-RW which used the reversible phase change of a crystallized state and an amorphous (amorphous) state by laser beam exposure as an optical information recording medium in which record of information, reproduction, and elimination are possible, DVD-RAM, -RW, and +RW, is expected.
[0003]Research and development are furthered about what comprised a recording layer which has a metastable Sb_3Te phase to which a recording layer belongs to space group Fm3m among the above-mentioned phase change type optical information recording media (Japanese Patent Application No. No. 217069 [ten to] etc.). This metastable phase differs from the recording layer of Sb-Te eutectic crystal structure, it does not separate into Sb and Sb_2Te_3, and disorder of the recording mark resulting from the grain boundary is not produced, either. Therefore, the thing using the recording layer which has a metastable Sb_3Te phase belonging to space group Fm3m has the strong point whose high density recording becomes possible. Repeatedly, since it is strong to the thermal shock at the time of record, the recording layer which has this metastable Sb_3Te phase has the outstanding repetition recording characteristic.
[0004]By the way, in the phase change type optical information recording medium using the recording layer which has the above-mentioned metastable Sb_3Te phase, a recording layer is produced by the vacuum producing-film methods, such as sputtering and vacuum evaporation, and the film immediately after film production has usually become an amorphous state. On the other hand, the recording layer of the optical information recording medium produced commercially must be a crystallized state. In the erasable light information record carrier using a phase transition, it is because record film is set as an amorphous state by a recorded state and is generally set as a crystallized state in the state of elimination (initialization).For this reason, the initialization process which heat-treats a laser beam exposure etc. and crystallizes a recording layer immediately after film production of a recording layer was required.
[0005]However, since the time for 30 seconds or more is required for the above-mentioned initialization process, in mass-producing by downing a throughput, it is [many devices for an initialization process / stand] necessary, and an installation cost not only becomes expensive, but they cause the rise of product cost.
[0006]Making it crystallize, after a recording layer's producing a film, and making an initializing step unnecessary by that cause from such a thing, by providing the crystallization promoting layer which consists of Bi or its compound in contact with at least a part of recording layer, was proposed (Japanese Patent Application No. No. 266970 [11 to]).

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, from having provided the crystallization promoting layer which consists of a Bi compound of a high-melting point in contact with at least a part of phase change recording layer which has a metastable Sb_3Te phase belonging to space group Fm3m according to the optical information recording medium of claim 1. A recording layer crystallizes immediately after film production, and the initialization process by heat treatment needed conventionally not only becomes unnecessary, but since the melting point of a crystallization promoting layer is high, in any at the time of record, elimination, and reproduction, a crystallization promoting layer does not carry out melting mixing with a recording layer. Therefore, change of the disk characteristic by presentation gap of a recording layer does not break out. As a result, an initializing step can be made unnecessary, without redesigning recording layer material.
[0045]According to the optical information recording medium of claim 2, since the melting point of the above-mentioned Bi compound considered it as not less than 700 **, a crystallization promoting layer cannot fuse in any of record, reproduction, and elimination, but melting mixing of a crystallization promoting layer and a recording layer can be avoided.
[0046]According to the optical information recording medium of claim 3, since a crystallization promoting layer does not fuse in any at the time of record, elimination, and reproduction, the fault by a crystallization promoting layer carrying out melting mixing with a recording layer is certainly avoidable.
[0047]Even if according to the optical information recording medium of claim 4 there should be many kinds of high-melting point compound compared with other compounds and a presentation gap should occur from a crystallization promoting layer being a compound of Bi and Ce at the time of target production and sputtering, it is hard to separate Bi (271 **) of a low melting point. Especially the compound with Ce has a large crystallization facilitatory effect, and very thin thickness also demonstrates a crystallization facilitatory effect. Since it can be effectively used from a crystallization facilitatory effect being still larger also to the recording layer which is hard to crystallize, the effect as a promotion layer can be acquired to the recording layer of a wider composition range.
[0048]According to the optical information recording medium of claim 5, since the crystallization promoting layer is a compound of Bi and Zr, when a presentation gap takes place in a direction with little Bi at the time of target production in Bi_2Zr_3, may become a mixture of BiZr and $BiZr_2$, and a peritectic, but. Bi of a low melting point does not separate. In addition to such a strong point, since the compound with Zr has cheap Zr as compared with the precious metals etc., and a compound is comparatively stable and target production is easy, material cost can be pressed down low.
[0049]According to the optical information recording medium of claim 6, since the thickness of a crystallization promoting layer is 0.2-5.0 nm, a desired crystallization facilitatory effect is acquired, and the optical influence of a crystallization promoting layer can be disregarded, and the recording medium where quality was stabilized can be provided.
[0050]According to the optical information recording medium of claim 7, to a recording layer A group Ib element, a group II element, From at least one of the elements chosen from group III elements, an IV group element, V group element, a VI group element, a rare earth element, and a transition metal element being added. Improvement in preservation reliability, improvement in a recording characteristic, etc. can be aimed at in the range which does not bar the appearance of the metastable Sb_3Te phase belonging to space group Fm3m and in which the crystallization temperature of a recording layer does not exceed 200 **.
[0051]According to the optical information recording medium of claim 8, since the above-mentioned IV group element is germanium, especially the effect of raising preservation reliability and a recording characteristic is remarkable.
[0052]According to the manufacturing method of the optical information recording medium of claim 9, since the above-mentioned crystallization promoting layer is produced between the 1st dielectric layer and a recording layer, a crystallization promotion operation can be demonstrated more effectively and a throughput can be raised.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, a presentation gap of a recording layer takes place and change produces a crystallization promoting layer in the disk characteristic in order to carry out melting mixing with a recording layer at the time of record and playback. In order to solve such a problem, it is necessary to perform the materials design in consideration of the mixture composition of a recording layer and a crystallization promoting layer but, and in order for redesign to take considerable development cost, it leads to the rise of product cost.
[0008]An object of this invention is to provide the phase change type optical information recording medium which makes an initialization process unnecessary and which does not cause a cost hike, without solving an above-mentioned problem and redesigning a recording layer presentation.

[Translation done.]

* NOTICES *

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MEANS

[Means for Solving the Problem]An aforementioned problem of this invention is attained by the following means. In an optical information recording medium which has a metastable Sb_3Te phase to which according to this invention it is an optical information recording medium which uses as a recording layer a phase change recording material which has Sb and Te in claim 1, and this recording layer belongs to space group Fm3m in the first place, It is characterized [main] by having touched this at least a part of recording layer, and providing a crystallization promoting layer which consists of a Bi compound of a high-melting point.
[0010]By claim 2, it is characterized [second] by the melting point of Bi compound being not less than 700 ** in an optical information recording medium given in above-mentioned claim 1.
[0011]By claim 3, a crystallization promoting layer does not fuse [third] in any at the time of record, elimination, and reproduction in an optical information recording medium given in above-mentioned claim 1 or 2.
[0012]By claim 4, a crystallization promoting layer consists [fourth] of a compound of Bi and Ce in an optical information recording medium given in above-mentioned claim 1, 2, or 3.
[0013]By claim 5, a crystallization promoting layer consists [fifth] of a compound of Bi and Zr in an optical information recording medium given in above-mentioned claim 1, 2, or 3.
[0014]By claim 6, it is characterized [sixth] by thickness of a crystallization promoting layer being 0.2-5.0 nm in an optical information recording medium given in above-mentioned claim 1, 2, 3, 4, or 5.
[0015]In an optical information recording medium given in above-mentioned claim 1, 2, 3, 4, 5, or 6 in seventh claim 7, It comes to add at least one of the elements chosen as this recording layer from a group Ib element, a group II element, group III elements, an IV group element, V group element, a VI group element, a rare earth element, and a transition metal element.
[0016]By claim 8, it is characterized [eighth] by this IV group element being germanium in an optical information recording medium given in above-mentioned claim 7.
[0017]By claim 9, it is characterized [ninth] by a manufacturing method of an optical information recording medium which produces a crystallization promoting layer in an optical information recording medium of above-mentioned claim 1 thru/or 8 given in any 1 paragraph on a substrate in order of the 1st dielectric layer, a crystallization promoting layer, and a recording layer.
[0018]
[Embodiment of the Invention]Hereafter, this invention is explained in full detail. Although the optical information recording medium of this invention produces each above-mentioned film one by one by the vacuum producing-film method and is produced on a substrate, By having provided the crystallization promoting layer which consists of a Bi compound of a high-melting point in contact with at least a part of recording layer, the recording layer which has the above-mentioned metastable Sb_3Te phase is crystallized after a film production process. In this invention, since the melting point of a crystallization promoting layer is high, a crystallization promoting layer does not fuse in any of record, reproduction, and elimination. Therefore, a crystallization promoting layer and a recording layer are not mixed and change of the disk characteristic by mixing does not break out. Thus, in this invention, the fault by being able to use the greatest crystallization facilitatory effect of Bi, and also a crystallization promoting layer carrying out melting mixing with a recording layer is also avoidable. Therefore, redesign of the recording layer material in consideration of the mixture composition of a recording layer and a crystallization promoting layer becomes unnecessary, and a medium can be provided more by low cost.
[0019]In this invention, as for the melting point of a crystallization promoting layer, in order not to fuse a crystallization promoting layer at the time of record, reproduction, and elimination, not less than 700 ** is desirable. The more it is high, the more it is hard to fuse, but if the melting point becomes high too much, production of a target becomes difficult and the melting point's is not preferred. Therefore, not less than 800 ** 1700 ** or less is not less than 1000 ** 1500 ** or less more preferably.
[0020]As a Bi compound of a high-melting point, Bi_2Ca_3 (melting point of 1200 **), $BiCe_3$ (1525 **), Bi_3Ce_4 (1630 **), BiCe (1400 **), Bi_2 Ce (883 **), BiIr (1420 **), $BiIr_2$ (1440 **), $BiLi_3$ (1145 **), Bi_2Mg_3 (823 **), BiMn (1095 **), BiRh (997 **), Bi_2 Rh (774 **), BiU, Bi_2Zr (714 **), BiZr (1302 **), Bi_2Zr_3 (1497 **), $BiZr_2$ (1342 **), $BiZr_3$ (1292 **), etc. are mentioned.
[0021]A compound with Zr and a compound with Ce are especially preferred. These two have many kinds of high-melting point compound compared with other compounds, and at the time of target production and sputtering, even if a presentation gap occurs, Bi (271 **) of a low melting point should not separate them easily. For example, when a presentation gap takes place in a direction with little Bi at the time of target production in Bi_2Zr_3, it may become a mixture of BiZr and $BiZr_2$, and a peritectic, but Bi of a low melting point does not separate. In addition to such a strong point, since the compound with Zr has cheap Zr as compared with the precious metals etc., and a compound is comparatively stable and target production is easy, material cost can be pressed down low.
[0022]Especially the compound with Ce has a large crystallization facilitatory effect, and very thin thickness also demonstrates a crystallization facilitatory effect. Since a crystallization facilitatory effect can use it from a large thing effectively also to the recording layer which is hard to crystallize, the effect as a promotion layer can be acquired to the recording layer of a wider composition range. Although the reason the crystallization facilitatory effect of a compound with Ce is large is not certain, the crystal structure of BiCe is a NaCl type and it is thought that it is because it belongs to the same Fm3m as a recording layer.
[0023]In this invention, a crystallization promoting layer may be provided in contact with the whole surface of a recording layer, and may be provided in contact with a part. May provide a crystallization promoting layer between the 1st dielectric layer and a recording layer, and, Although it may provide between a recording layer and the 2nd dielectric layer and may provide in the both, it is desirable to provide between the 1st dielectric layer and a recording layer from a viewpoint of effective exertion of a crystallization promotion operation and improvement in a throughput. A crystallization promoting layer may be a continuation film, it may be a discontinuous film of island shape, and both desired crystallization facilitatory effects are acquired. A crystallization promoting layer is formed by the vacuum producing-film methods, such as sputtering and vacuum evaporation. 0.2-20 nm of thickness [0.2-5.0 nm of] of a crystallization promoting layer is 0.5-2.0 nm still more preferably more preferably. As for the thickness of a crystallization promoting layer, it is desirable that it is 1 / 100 - 1/2 of recording layer thickness, and it is still more desirable that it is 1 / 50 - 1/10. A desired crystallization facilitatory effect is acquired as the thickness of a crystallization promoting layer is within the limits of the above, and the optical influence of a crystallization promoting layer can be disregarded, and offer of the medium where quality was stabilized is attained.
[0024]The recording layer which has a metastable Sb_3Te phase belonging to space group Fm3m is used for the recording layer of the optical information recording medium of this invention. And at least one of the elements chosen as this recording layer from a group Ib element, a group II

element, group III elements, an IV group element, V group element, a VI group element, a rare earth element, and a transition metal element is added if needed [, such as improvement in preservation reliability, and improvement in a recording characteristic,]. An alloying element is a range which does not bar the appearance of the metastable Sb_3Te phase belonging to space group Fm3m, and the crystallization temperature of a recording layer can add it in the range which does not exceed 200 **. When which element is added, depending on the crystallization temperature of a recording layer, it is easy to crystallize the ease of carrying out of crystallization of a recording layer, so that crystallization temperature is low. Although it can ask for the crystallization temperature of a recording layer by thermometric analysis, since it stops crystallizing if crystallization temperature exceeds 200 ** when it thinks with the measured value for heating-rate/of 10 ** only by passing through a film production process, it is not preferred. Preferably, crystallization temperature is 140-185 ** more preferably, and can add 120 ** - 200 ** of the above-mentioned elements in this range.
[0025]In the above-mentioned element, germanium is an especially effective alloying element. Especially the effect of germanium of raising preservation reliability and a recording characteristic is remarkable. germanium may add only germanium independently and may add it with other elements. As such a recording layer, there are GeAgInSbTe added with GeSbTe, Ag, and In which added only germanium, GeInSbTe added with In, GeAgSbTe added with Ag, etc. by using Sb and Te as the main ingredients, for example. GeSbTe here differs from the $germanium_2Sb_2Te_5$ system of the compound system material known from the former. The $germanium_2Sb_2Te_5$ system known from the former to being a $GeTe-Sb_2Te_3$ system in this invention. It uses that an optical property changes in the phase transition between a Sb_3Te metastable phase and an amorphous phase to the last. Composition ranges also differ greatly.
[0026]10-100 nm of thickness [15-35 nm of] of a recording layer is 17-25 nm still more preferably more preferably. If thinner than 10 nm, optical absorption ability will fall and the function as a recording layer will be lost. Since the transmitted light decreases, it becomes impossible on the other hand, to expect cross protection, if thicker than 100 nm.
[0027]The example of composition of the optical information recording medium by this invention is shown in drawing 1. In a crystallization promoting layer and 4, a recording layer and 5 are [the 1st dielectric layer and 3 / the 2nd dielectric layer and 6] reflection radiation layers, and, as for 7, 1 is [a substrate and 2] the organic environmental protection layers (UV-curing-resin layer) provided on 6 if needed. Since explanation of the crystallization promoting layer 3 and the recording layer 4 was given in the above, the composition of other layers is explained below.
[0028]In this invention, as the 1st and 2nd dielectric layers (protective layer) 2 and 5, SiOx, ZnO, SnO_2, and $aluminum_2O_3$, TiO_2 and In_2O_3, MgO, ZrO_2, Carbide, such as sulfides, such as nitrides, such as metallic oxides, such as Ta_2O_5, Si_3N_4, AlN, TiN, BN, and ZrN, ZnS, and TaS_4, SiC, TaC, B_4C, WC, TiC, and ZrC, is mentioned. Such materials can be alone used as a protective layer, and can also be used as a mixture. For example, ZnS, SiOx, and Ta_2O_5 and SiOx are mentioned as a mixture. It is required that these materials physical properties have adhesion with thermal conductivity, specific heat, a coefficient of thermal expansion, a refractive index and a substrate material, or recording layer material, etc., are high, and are small, and adhesion is good. [of a coefficient of thermal expansion] [of the melting point] Especially the 2nd dielectric layer influences repetitive overwriting characteristics.
[0029]As for the thickness of the 1st dielectric layer 2, 75 nm - 200 nm are preferred as a range of 50-250 nm. If it becomes thinner than 50 nm, it becomes the fall of an environment-resistant protection feature, a heat-resistant fall, and the fall of ********, and is not desirable. in the film production process by a sputtering technique etc. on the other hand if it becomes thicker than 250 nm -- film temperature -- since film peeling and a crack occur by the rise of a degree or the fall of the sensitivity at the time of record is brought about, it is not desirable.
[0030]The thickness of the 2nd derivation body whorl 5 considers it as the range of 10 nm - 100 nm, and 15 nm - 50 nm are preferred. If thinner than 10 nm in the case of the 2nd dielectric layer, heat resistance falls fundamentally and it is not desirable. If 100 nm is exceeded, repetitive overwriting characteristics will worsen due to the fall of the film peeling by the fall of recording sensitivity, and a rise in heat, modification, and heat dissipation nature.
[0031]As the reflection radiation layer 6, the simple substance of a material centering on metal, such as aluminum, Au, Cu, Ag, Cr, Sn, Zn, In, Pd, Zr, Fe, Co, nickel, Si, germanium, Sb, Ta, W, Ti, and Pb, or an alloy, and a mixture can be used. The plural laminates of different metal, alloy, or mixture may be carried out if needed. It is important for this layer to miss heat efficiently, and thickness may be 30 nm - 250 nm. 50 nm - 150 nm are preferably good. When thickness is too thick, radiation efficiency is too good, when sensitivity worsens and is too thin, it is highly sensitive, but repetitive overwriting characteristics worsen. As the characteristic, thermal conductivity is high and it is required with a high-melting point that adhesion with the charge of a protective layer material should be good etc.
[0032]For example, record reproduction of the optical information recording medium by the material and composition which were described above can be carried out using the pickup of NA0.6 with a semiconductor laser (NA0.6 or 650 nm) with the semiconductor laser whose wavelength is 635 nm. As a record method, a modulation code can use EFM or an EFM+ [8 / 16RLL (2, 10)] method, for example by Pulse Width Modulation. In this case, a pulse is divided into the multi-pulse part of a leading pulse and after that. A multi-pulse part is for repeating heating and cooling and performing them.
[0033]In the above-mentioned case, the relation of each power serves as heating (record) power > erase power > cooling power, and cooling power is lowered to a read-out power grade. Read-out power is performed at 1 mW or less.

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(54)【発明の名称】　光情報記録媒体及びその製造方法

(57)【要約】
【課題】　Ｓｂ及びＴｅを有する相変化記録材料を記録層とする光情報記録媒体であって、該記録層が空間群Ｆｍ３ｍに属する準安定Ｓｂ，Ｔｅ相を有する光情報記録媒体において、記録層組成の再設計を行うことなく、初期化プロセスを不要とする光情報記録媒体を提供すること。
【解決手段】　該記録層の少なくとも一部分に接して、高融点のＢｉ化合物からなる結晶化促進層を設けることを主要な構成とする。その他８項ある。

【特許請求の範囲】

【請求項１】　Ｓｂ及びＴｅを有する相変化記録材料を記録層とする光情報記録媒体であって、該記録層が空間群Ｆｍ３ｍに属する準安定Sb_3Te相を有する光情報記録媒体において、該記録層の少なくとも一部分に接して、高融点のＢｉ化合物からなる結晶化促進層を設けたことを特徴とする光情報記録媒体。

【請求項２】　請求項１記載の光情報記録媒体において、Ｂｉ化合物の融点が７００℃以上であることを特徴とする光情報記録媒体。

【請求項３】　請求項１または２記載の光情報記録媒体において、結晶化促進層が記録、消去、再生時のいずれにおいても、溶融しないことを特徴とする光情報記録媒体。

【請求項４】　請求項１、２または３記載の光情報記録媒体において、結晶化促進層がＢｉとＣｅとの化合物からなることを特徴とする光情報記録媒体。

【請求項５】　請求項１、２または３記載の光情報記録媒体において、結晶化促進層がＢｉとＺｒとの化合物からなることを特徴とする光情報記録媒体。

【請求項６】　請求項１、２、３、４または５記載の光情報記録媒体において、結晶化促進層の膜厚が０．２～５．０ｎｍであることを特徴とする光情報記録媒体。

【請求項７】　請求項１、２、３、４、５または６記載の光情報記録媒体において、該記録層にＩｂ族元素、II族元素、III 族元素、IV族元素、V族元素、VI族元素、希土類元素及び遷移金属元素より選択される元素の少なくとも１つが添加されてなることを特徴とする光情報記録媒体。

【請求項８】　請求項７記載の光情報記録媒体において、該IV族元素がＧｅであることを特徴とする光情報記録媒体。

【請求項９】　請求項１乃至８のいずれか１項記載の光情報記録媒体における結晶化促進層を基板上に第１の誘電体層、結晶化促進層、記録層の順に製膜することを特徴とする光情報記録媒体の製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、光情報記録媒体に関し、更に詳しくは、ＣＤ－ＲＷ、ＤＶＤ－ＲＡＭ、－ＲＷ、＋ＲＷなどのメディアとして使用される、書き換え可能な相変化型光情報記録媒体であって、空間群Ｆｍ３ｍに属する準安定Sb_3Te相を有する記録層を有する光情報記録媒体及びその製造方法に関するものである。

【０００２】

【従来の技術】レーザビーム照射により情報の記録、再生及び消去が可能な光情報記録媒体として、結晶状態と非晶質（アモルファス）状態の可逆的相変化を利用した相変化ＣＤ－ＲＷ、ＤＶＤ－ＲＡＭ、－ＲＷ、＋ＲＷなどのメディアとしての商品化が期待されている。

【０００３】上記相変化型光情報記録媒体のうち、記録層が空間群Ｆｍ３ｍに属する準安定Sb_3Te相を有する記録層で構成されたものについて研究、開発が進められている（特願平１０－２１７０６９号等）。この準安定相はＳｂ－Ｔｅ共晶構造の記録層とは異なっており、ＳｂとSb_2Te_3とに分離せず、結晶粒界に起因する記録マークの乱れも生じない。そのため、空間群Ｆｍ３ｍに属する準安定Sb_3Te相を有する記録層を用いたものは、高密度記録が可能となる長所をもっている。さらに、この準安定Sb_3Te相を有する記録層は繰り返し記録時の熱衝撃に強いため、優れた繰り返し記録特性を有している。

【０００４】ところで、上記の準安定Sb_3Te相を有する記録層を用いた相変化型光情報記録媒体では、記録層はスパッタリングや蒸着などの真空製膜法で製膜され、製膜直後の膜は、通常、非晶質状態となっている。一方、製品化された光情報記録媒体の記録層は結晶状態でなければならない。なぜなら、相転移を利用する書き換え型の光情報記録担体では、一般に記録膜が記録状態では非晶質状態に、消去（初期化）状態では結晶状態に設定されるからである。このため、記録層の製膜直後に、レーザビーム照射などの熱処理を施して記録層を結晶化させる初期化プロセスが必要であった。

【０００５】しかしながら、上記初期化プロセスには３０秒以上の時間が必要であるため、スループットがダウンし、量産を行う場合には初期化プロセスのための装置が多数台必要となり、設備費が高価になるのみでなく製品コストの上昇を招く。

【０００６】こうしたことから、記録層の少なくとも一部分に接してＢｉ又はその化合物からなる結晶化促進層を設けることにより記録層が製膜後に結晶化するようにし、それにより、初期化工程を不要とすることが提案された（特願平１１－２６６９７０号）。

【０００７】

【発明が解決しようとする課題】しかしながら、結晶化促進層は、記録、再生時には記録層と共に溶融混合するため、記録層の組成ずれが起こり、ディスク特性に変動が生じる。こうした問題を解決するためには、記録層と結晶化促進層の混合組成を考慮した材料設計を行う必要があるが、再設計には相当の開発コストを要するため、製品コストの上昇につながる。

【０００８】本発明は、上述の問題点を解決し、記録層組成の再設計を行うことなく、初期化プロセスを不要とする、コストアップを招かない相変化型光情報記録媒体を提供することを目的とする。

【０００９】

【課題を解決するための手段】本発明の上記課題は、下記の手段により達成される。本発明によれば、第一に、請求項１では、Ｓｂ及びＴｅを有する相変化記録材料を

記録層とする光情報記録媒体であって、該記録層が空間群Ｆｍ３ｍに属する準安定Sb_3Te相を有する光情報記録媒体において、該記録層の少なくとも一部分に接して、高融点のＢｉ化合物からなる結晶化促進層を設けたことを主要な特徴とする。

【００１０】第二に、請求項２では上記請求項１記載の光情報記録媒体において、Ｂｉ化合物の融点が７００℃以上であることを特徴とする。

【００１１】第三に、請求項３では、上記請求項１または２記載の光情報記録媒体において、結晶化促進層が、記録、消去、再生時のいずれにおいても、溶融しないことを特徴とする。

【００１２】第四に、請求項４では、上記請求項１、２または３記載の光情報記録媒体において、結晶化促進層がＢｉとＣｅとの化合物からなることを特徴とする。

【００１３】第五に、請求項５では、上記請求項１、２または３記載の光情報記録媒体において、結晶化促進層がＢｉとＺｒとの化合物からなることを特徴とする。

【００１４】第六に、請求項６では、上記請求項１、２、３、４または５記載の光情報記録媒体において、結晶化促進層の膜厚が０．２～５．０ｎｍであることを特徴とする。

【００１５】第七に、請求項７では、上記請求項１、２、３、４、５または６記載の光情報記録媒体において、該記録層にＩｂ族元素、II族元素、III 族元素、IV族元素、Ｖ族元素、VI族元素、希土類元素及び遷移金属元素より選択される元素の少なくとも１つが添加されてなることを特徴とする。

【００１６】第八に、請求項８では、上記請求項７記載の光情報記録媒体において、該IV族元素がＧｅであることを特徴とする。

【００１７】第九に、請求項９では、上記請求項１乃至８のいずれか１項記載の光情報記録媒体における結晶化促進層を基板上に第１の誘電体層、結晶化促進層、記録層の順に製膜する光情報記録媒体の製造方法を特徴とする。

【００１８】

【発明の実施の形態】以下、本発明について詳述する。本発明の光情報記録媒体は、基板上に上記各膜を真空製膜法により順次製膜して作製されるが、記録層の少なくとも一部分に接して高融点のＢｉ化合物からなる結晶化促進層を設けたことにより、上記の準安定Sb_3Te相を有する記録層は、製膜プロセス後には結晶化している。さらに、本発明では、結晶化促進層の融点が高いため、記録、再生、消去いずれにおいても結晶化促進層は溶融しない。そのため、結晶化促進層と記録層とが混合することがなく、混合によるディスク特性の変動が起きない。このように、本発明ではＢｉの絶大な結晶化促進効果を利用できる上に、結晶化促進層が記録層と溶融混合することによる不具合をも回避することができる。従って、記録層と結晶化促進層の混合組成を考慮した記録層材料の再設計が不要となり、より低コストで媒体を提供することができる。

【００１９】本発明において、記録、再生、消去時に結晶化促進層を溶融しないようにするため、結晶化促進層の融点は７００℃以上が望ましい。融点は高ければ高いほど溶融しにくいが、融点が高くなり過ぎるとターゲットの作製が困難となり好ましくない。よって、好ましくは８００℃以上１７００℃以下、より好ましくは、１０００℃以上１５００℃以下である。

【００２０】高融点のＢｉ化合物としては、Bi_2Ca_3（融点１２００℃）、$BiCe_3$（１５２５℃）、Bi_3Ce_4（１６３０℃）、ＢｉＣｅ（１４００℃）、Bi_2Ce（８８３℃）、ＢｉＩｒ（１４２０℃）、$BiIr_2$（１４４０℃）、$BiLi_3$（１１４５℃）、Bi_2Mg_3（８２３℃）、ＢｉＭｎ（１０９５℃）、ＢｉＲｈ（９９７℃）、Bi_2Rh（７７４℃）、ＢｉＵ、Bi_2Zr（７１４℃）、ＢｉＺｒ（１３０２℃）、Bi_2Zr_3（１４９７℃）、$BiZr_2$（１３４２℃）、$BiZr_3$（１２９２℃）などが挙げられる。

【００２１】中でもＺｒとの化合物やＣｅとの化合物が好ましい。この２つは、他の化合物に比べて高融点化合物の種類が多く、ターゲット作製時やスパッタリング時に万が一、組成ずれが起きたとしても、低融点のＢｉ（２７１℃）が遊離しにくい。たとえば、Bi_2Zr_3の場合、ターゲット作製時にＢｉが少ない方に組成ずれが起きた場合、ＢｉＺｒ、$BiZr_2$の混合物、包晶となることはあるが、低融点のＢｉが遊離することはない。こうした長所に加えて、Ｚｒとの化合物は、Ｚｒが貴金属などと比較して安価であり、また化合物が比較的安定でターゲット作製が容易であることなどから、材料コストを低くおさえることができる。

【００２２】また、Ｃｅとの化合物は結晶化促進効果が特に大きく、ごく薄い膜厚でも結晶化促進効果を発揮する。結晶化促進効果が大きいことから、結晶化しにくい記録層に対しても有効に使用できるため、より広い組成範囲の記録層に対して、促進層としての効果を得ることができる。Ｃｅとの化合物の結晶化促進効果が大きい理由は定かでないが、ＢｉＣｅの結晶構造がＮａＣｌ型であって、記録層と同一のＦｍ３ｍに属しているためだと考えられる。

【００２３】本発明において結晶化促進層は記録層の全面に接して設けてもよいし、一部分に接して設けてもよい。また、結晶化促進層は第１の誘電体層と記録層との間に設けてよいし、記録層と第２の誘電体層との間に設けてもよいし、その両方に設けてもよいが、結晶化促進作用の効果的な発揮及びスループットの向上の観点から、第１の誘電体層と記録層との間に設けることが望ましい。また、結晶化促進層は連続膜であってもよいし、

島状の不連続膜であってもよく、ともに所望の結晶化促進効果が得られる。結晶化促進層は、スパッタリング、蒸着などの真空製膜法で形成される。結晶化促進層の膜厚は０．２～２０ｎｍ、より好ましくは０．２～５．０ｎｍ、さらに好ましくは０．５～２．０ｎｍである。また、結晶化促進層の膜厚は記録層膜厚の１／１００～１／２であることが望ましく、１／５０～１／１０であることがさらに望ましい。結晶化促進層の膜厚が上記の範囲内であると、所望の結晶化促進効果が得られると共に、結晶化促進層の光学的な影響を無視することができ、品質の安定した媒体の提供が可能となる。

【００２４】本発明の光情報記録媒体の記録層には、空間群Ｆｍ３ｍに属する準安定Sb_3Te相を有する記録層が使用される。そして、保存信頼性の向上、記録特性の向上など、必要に応じて、該記録層にＩｂ族元素、II族元素、III 族元素、IV族元素、V族元素、VI族元素、希土類元素及び遷移金属元素より選択される元素の少なくとも１つが添加される。添加元素は、空間群Ｆｍ３ｍに属する準安定Sb_3Te相の出現を妨げない範囲で、かつ記録層の結晶化温度が、２００℃を越えない範囲で添加することができる。記録層の結晶化のしやすさは、いずれの元素を添加した場合においても記録層の結晶化温度に依存し、結晶化温度が低いほど結晶化しやすい。記録層の結晶化温度は、熱分析により求めることができるが、昇温速度１０℃／分での測定値で考えた場合、結晶化温度が２００℃を越えると、製膜プロセスを経ただけでは結晶化しなくなるので好ましくない。結晶化温度は、好ましくは１２０℃～２００℃、より好ましくは１４０～１８５℃であり、この範囲において、上記元素を添加することができる。

【００２５】上記元素の中では、Ｇｅが中でも有効な添加元素である。Ｇｅは保存信頼性、記録特性を向上させる効果が特に顕著である。Ｇｅは、Ｇｅだけを単独で添加しても良いし、他の元素と共に添加しても良い。こうした記録層としては、例えば、Ｓｂ、Ｔｅを主成分として、Ｇｅだけを添加したＧｅＳｂＴｅ、Ａｇ、Ｉｎと共に添加したＧｅＡｇＩｎＳｂＴｅ、Ｉｎと共に添加したＧｅＩｎＳｂＴｅ、Ａｇと共に添加したＧｅＡｇＳｂＴｅなどがある。なお、ここでいうＧｅＳｂＴｅは、従来から知られている化合物系材料の$Ge_2Sb_2Te_5$系とは異なったものである。従来から知られている$Ge_2Sb_2Te_5$系が$GeTe-Sb_2Te_3$系であるのに対し、本発明では、あくまでもSb_3Te準安定相とアモルファス相との間の相転移において光学的性質が変化することを利用したものである。また、組成範囲も大きく異なっている。

【００２６】記録層の膜厚は１０～１００ｎｍ、より好ましくは１５～３５ｎｍ、さらに好ましくは１７～２５ｎｍである。１０ｎｍより薄いと、光吸収能が低下し記録層としての機能を失う。一方、１００ｎｍより厚いと、透過光が少なくなるため干渉効果を期待できなくなる。

【００２７】本発明による光情報記録媒体の構成例を図１に示す。１が基板、２が第１の誘電体層、３が結晶化促進層、４が記録層、５が第２の誘電体層、６が反射放熱層であり、７は必要に応じて６の上に設けられる有機環境保護層（ＵＶ硬化樹脂層）である。上記において結晶化促進層３と記録層４の説明をしたので、以下にその他の層の構成について説明する。

【００２８】本発明において、第１及び第２の誘電体層（保護層）２及び５としては、ＳｉＯｘ、ＺｎＯ、SnO_2、Al_2O_3、TiO_2、In_2O_3、ＭｇＯ、ZrO_2、Ta_2O_5等の金属酸化物、Si_3N_4、ＡｌＮ、ＴｉＮ、ＢＮ、ＺｒＮ等の窒化物、ＺｎＳ、TaS_4、等の硫化物、ＳｉＣ、ＴａＣ、B_4C、ＷＣ、ＴｉＣ、ＺｒＣ等の炭化物が挙げられる。これらの材料は、単体で保護層として用いることができるし、また混合物として用いることもできる。例えば混合物としては、ＺｎＳとＳｉＯｘ，Ta_2O_5とＳｉＯｘが挙げられる。これら材料物性は、熱伝導率、比熱、熱膨張係数、屈折率及び基板材料あるいは記録層材料との密着性等があり、融点が高く、熱膨張係数が小さく、密着性が良いといったことが要求される。特に第２の誘電体層は、繰り返しオーバーライト特性を左右する。

【００２９】第１の誘電体層２の膜厚は５０～２５０ｎｍの範囲として、７５ｎｍ～２００ｎｍが好ましい。５０ｎｍより薄くなると、耐環境性保護機能の低下、耐熱性低下、畜熱効果の低下となり好ましくない。一方、２５０ｎｍより厚くなると、スパッタ法等による製膜過程において、膜温度の上昇により膜剥離やクラックが発生したり、記録時の感度の低下をもたらすので好ましくない。

【００３０】第２の誘導体層５の膜厚は１０ｎｍ～１００ｎｍの範囲とし、１５ｎｍ～５０ｎｍが好ましい。第２の誘電体層の場合、１０ｎｍより薄いと、基本的に耐熱性が低下し好ましくない。１００ｎｍを越えると、記録感度の低下、温度上昇による膜剥離、変形、放熱性の低下により繰り返しオーバーライト特性が悪くなる。

【００３１】反射放熱層６としては、Ａｌ、Ａｕ、Ｃｕ、Ａｇ、Ｃｒ、Ｓｎ、Ｚｎ、Ｉｎ、Ｐｄ、Ｚｒ、Ｆｅ、Ｃｏ、Ｎｉ、Ｓｉ、Ｇｅ、Ｓｂ、Ｔａ、Ｗ、Ｔｉ、Ｐｂ等の金属を中心とした材料の単体、あるいは合金、混合物を用いることができる。必要に応じて、異なる金属、合金又は混合物を複数積層しても良い。この層は、熱を効率的に逃がすことが重要であり、膜厚は３０ｎｍ～２５０ｎｍとする。好ましくは５０ｎｍ～１５０ｎｍが良い。膜厚が厚すぎると、放熱効率が良すぎて感度が悪くなり、薄すぎると、感度は良いが繰り返しオーバーライト特性が悪くなる。特性としては、熱伝導率が高く、高融点で保護層材料との密着性が良いこと等が要求

される。

【００３２】上記で述べた材料、構成による光情報記録媒体は、例えば、波長が６３５ｎｍの半導体レーザーでＮＡ０．６か、あるいは６５０ｎｍの半導体レーザーでＮＡ０．６のピックアップを用い記録再生することができる。記録方法としては、例えばＰｕｌｓｅ Ｗｉｄｔｈ Ｍｏｄｕｌａｔｉｏｎで変調コードがＥＦＭあるいはＥＦＭ+［8／１６ＲＬＬ（２，１０）］方式を用いることができる。この場合、パルスは、先頭パルスとその後のマルチパルス部に分かれる。マルチパルス部は、加熱、冷却を繰り返し行うためのものである。

【００３３】また、上記の場合、各パワーの関係は、加熱（記録）パワー＞消去パワー＞冷却パワーとなっていて、冷却パワーは読み出しパワー程度まで下げる。読み出しパワーは１ｍW以下で行う。

【００３４】（実施例）以下、本発明を実施例に基づき説明する。本実施例では５チャンバーを有する枚葉型スパッタ装置にて成膜を行った。ただし、チャンバー数は５個にこだわる必要はなく、５個以上であれば生産上可能である。各成膜の内訳を以下に示す。

成膜室１（以下ＰＣ１と略記）：ＺｎＳ・ＳｉO_2（第１の誘電体層）
成膜室２（以下ＰＣ２と略記）：結晶化促進層
成膜室３（以下ＰＣ３と略記）：記録層
成膜室４（以下ＰＣ４と略記）：ＺｎＳ・ＳｉO_2（第２の誘電体層）
成膜室５（以下ＰＣ５と略記）：Ａｌ（反射放熱層）

【００３５】実施例１～６、比較例１～６
射出成形により直径１２０ｍｍ、厚さ０．６ｍｍのポリカーボネート基板（以下ＰＣ基板と略記）を作製した。ＰＣ１で、このＰＣ基板上に、以下の条件によりＺｎＳ・ＳｉO_2膜をスパッタリング法で形成した。

ターゲット材：ＳｉO_2（２０．５ｍｏｌ％）、ＺｎＳ（７９．５ｍｏｌ％）
投入電力：ＲＦ４ｋW／８インチターゲット
ガス圧力：２ｍＴｏｒｒ
ガス種：Ａｒ
膜厚：１９０ｎｍ

【００３６】次に、ＰＣ２で、以下の条件により結晶化促進層（表１）を形成した。

ターゲット材：表１
投入電力：ＤＣ０．４ｋW／８インチターゲット
ガス圧力：２ｍＴｏｒｒ
ガス種：Ａｒ
膜厚：０．５ｎｍ、２．０ｎｍ、５．０ｎｍ

次に、ＰＣ３で、以下の条件により、表１に挙げた組成を有する空間群Ｆｍ３ｍに属する準安定Sb_3Te相を有する記録層（記録層）を形成した。

ターゲット材：合金ターゲット（組成は表１）
投入電力：ＤＣ０．４ｋW／８インチターゲット
ガス圧力：２ｍＴｏｒｒ
ガス種：Ａｒ
膜厚：１５ｎｍ

次に、ＰＣ４で、以下の条件によりＺｎＳ・ＳｉO_2膜（第２の誘電体層）をスパッタリング法で形成した。

ターゲット材：ＳｉO_2（２０．５ｍｏｌ％）、ＺｎＳ（７９．５ｍｏｌ％）
投入電力：ＲＦ４ｋW／８インチターゲット
ガス圧力：２ｍＴｏｒｒ
ガス種：Ａｒ
膜厚：２０ｎｍ

次に、ＰＣ５で、以下の条件によりＡｌ膜（反射放熱層）を形成した。

ターゲット材：Ａｌ
投入電力：ＤＣ５ｋW／８インチターゲット
ガス圧力：２ｍＴｏｒｒ
ガス種：Ａｒ
膜厚：１４０ｎｍ

さらに、上記Ａｌ膜の上にＵＶ硬化樹脂を３μｍ厚に塗布した後、ＵＶ光を照射して有機環境保護層を形成し、本発明による相変化型光ディスクを作製した。

【００３７】実施例１～６について反射率を測定したところ、いずれも１８％以上であり、初期化工程なしで記録層が結晶化していた。また、Ｘ線回折装置により記録層の結晶構造を調べたところ、いずれも空間群Ｆｍ３ｍに属するものであった。次に、初期化プロセスを行わずに情報の記録再生を行ったところ、問題なく記録再生を行うことができた。繰り返し記録特性、保存性信頼性も良好であった。結晶化促進層を設けずに通常のレーザー初期化を行った場合と初期化ジッタを比較したところ、ほとんど変動が見られなかった。（結晶化促進層を設けた時のジッタσ／Ｔ［%］をｘ、設けなかった時のジッタσ／Ｔ［%］をｙとし、

$\Delta = x - y$ ［%］

を求めたものを表１に示した。）

【００３８】一方、比較例１～６について、反射率を測定したところ、いずれも１８％以上であり、初期化工程なしで記録層が結晶化していたが、情報の記録再生を行ったところ、結晶化促進層を設けずに通常のレーザー初期化を行った場合と比較して、ジッタ特性が悪化していた。記録層と結晶化促進層の混合組成を考慮して記録層材料の再設計が必要であることがわかる。

【００３９】以上の結果より、結晶化促進層を融点７００℃以上の高融点Ｂｉ化合物とすることで、本発明では記録層の再設計を行うことなく、初期化工程を不要にできることがわかる。

【００４０】なお、実施例１～４については、別ロットのターゲットを使用した場合、成膜を繰り返し行いターゲットエロージョンが進行した場合、いずれの場合においても、Δに変化はなく促進層を設けたことによるジッ

タ特性の低下は見られなかった。一方、実施例５については、別ロットのターゲットを用いた時にΔが増大し、結晶化促進層を設けたことでジッタ特性が低下する場合があった。また、実施例６については、エロージョンの進行したターゲットを用いた場合には、Δが増大し、結晶化促進層を設けたことでジッタ特性が低下する場合があった。これらの原因はいずれも組成ずれによるＢｉの遊離が原因と考えられる。以上より、Ｚｒとの化合物か、Ｃｅとの化合物を用いることで確実にジッタ特性の低下を防止できることがわかる。

【００４１】実施例７

結晶化促進層をＢｉＣｅとした。記録層は、結晶化温度が１２０℃～１８０℃の範囲にあるものとし、実施例１～６と同様にして、ディスクを作製した。ディスクの反射率を測定したところ、いずれも１８％以上であり、初期化工程なしで記録層が結晶化していた。初期化プロセ＊スなしで問題なく記録再生を行うことができた。結晶化促進層を設けずに通常のレーザー初期化を行った場合と初期化ジッタを比較したところ、ほとんど変動が見られなかった。

【００４２】比較例７

結晶化促進層をＢｉＩｒとした以外は、実施例６と同様にメディアを作製した。ディスクの反射率を測定したところ、記録層の結晶化温度が１６０℃まではいずれも１８％以上であり、初期化工程なしで記録層が結晶化していたが、それ以上では反射率は１８％以下となり、初期化工程が必要であった。以上より、Ｃｅとの化合物を用いることで、結晶化温度の高い記録層でも初期化工程が不要とできる。すなわち、適用できる記録層組成の範囲が広がることがわかる。

【００４３】

【表１】

	記録材料	記録促進層 材料（融点）	反射率 （%）	Δ （%）
実施例 1	Ag3 In5 Sb65 Te27	BiZr(1302℃)	>18	0.2
実施例 2	Ag0.5 In4.5 Sb68 Te25 Ge2	Bi2Zr3(1497℃)	>18	0
実施例 3	In2 Sb68 Te27 Ge3	BiCe(1400℃)	>18	0.1
実施例 4	Sb69 Te25 Ge6	Bi2Zr(714℃)	>18	0.2
実施例 5	Ag3 In2 Sb68 Te25 V2	BiRb(997℃)	>18	0.1
実施例 6	Ag0.5 In4.5 Sb68 Te25 Ge2	BiLi3(1145℃)	>18	0.3
比較例 1	Ag3 In5 Sb65 Te27	Bi(271℃)	>18	1.2
比較例 2	Ag0.5 In4.5 Sb68 Te25 Ge2	Bi(271℃)	>18	1.3
比較例 3	In2 Sb68 Te27 Ge3	Bi(271℃)	>18	2.0
比較例 4	Sb69 Te25 Ge6	Bi2Te3(585℃)	>18	1.4
比較例 5	Ag3 In2 Sb68 Te25 V2	Bi2Te3(585℃)	>18	1.1
比較例 6	Ag0.5 In4.5 Sb68 Te25 Ge2	Bi2Te3(585℃)	>18	2.0

【００４４】

【発明の効果】以上のように、請求項１の光情報記録媒体によれば、空間群Ｆｍ３ｍに属する準安定Sb_3Te相を有する相変化記録層の少なくとも一部分に接して高融点のＢｉ化合物からなる結晶化促進層を設けたことから、記録層が製膜直後に結晶化し、従来必要とされていた熱処理による初期化プロセスが不要となるだけでなく、結晶化促進層の融点が高いため、記録、消去、再生時のいずれにおいても、結晶化促進層が記録層と溶融混合しない。そのため、記録層の組成ずれによるディスク特性の変動が起きない。その結果、記録層材料の再設計を行うことなく、初期化工程を不要とすることができる。

【００４５】請求項２の光情報記録媒体によれば、上記Ｂｉ化合物の融点が７００℃以上としたことから、記録、再生、消去のいずれにおいても結晶化促進層が溶融せず、結晶化促進層と記録層の溶融混合を回避することができる。

【００４６】請求項３の光情報記録媒体によれば、結晶化促進層が記録、消去、再生時のいずれにおいても溶融しないことから、結晶化促進層が記録層と溶融混合することによる不具合を確実に回避することができる。

【００４７】請求項４の光情報記録媒体によれば、結晶化促進層がＢｉとＣｅとの化合物であることから、他の化合物に比べて高融点化合物の種類が多く、ターゲット作製時やスパッタリング時に万が一、組成ずれが起きたとしても、低融点のＢｉ（２７１℃）が遊離しにくい。またＣｅとの化合物は結晶化促進効果が特に大きく、ごく薄い膜厚でも結晶化促進効果を発揮する。さらに結晶化促進効果が大きいことから、結晶化しにくい記録層に対しても有効に使用できるため、より広い組成範囲の記録層に対して、促進層としての効果を得ることができる。

【００４８】請求項５の光情報記録媒体によれば、結晶化促進層がＢｉとＺｒとの化合物であることから、Bi_2Zr_3の場合、ターゲット作製時にＢｉが少ない方に組成ずれが起きた場合、ＢｉＺｒ、$BiZr_2$の混合物、包晶となることはあるが、低融点のＢｉが遊離することはない。このような長所に加えて、Ｚｒとの化合物は、Ｚｒが貴金属などと比較して安価であり、また化合物が比較的安定でターゲット作製が容易であることなどから、材料コストを低くおさえることができる。

【００４９】請求項６の光情報記録媒体によれば、結晶化促進層の膜厚が０．２～５．０ｎｍであることから、所望の結晶化促進効果が得られると共に、結晶化促進層の光学的な影響を無視することができ、品質の安定した記録媒体を提供することができる。

【００５０】請求項７の光情報記録媒体によれば、記録層にＩｂ族元素、II族元素、III 族元素、IV族元素、Ｖ族元素、VI族元素、希土類元素及び遷移金属元素より選択される元素の少なくとも１つが添加されることから、空間群Ｆｍ３ｍに属する準安定Sb_3Te相の出現を妨げず、かつ記録層の結晶化温度が２００℃を越えない範囲で、保存信頼性の向上や記録特性の向上などを図ることができる。

【００５１】請求項８の光情報記録媒体によれば、上記IV族元素がＧｅであることから、保存信頼性や記録特性を向上させる効果が特に顕著である。

【００５２】請求項９の光情報記録媒体の製造方法によれば、上記結晶化促進層を第１の誘電体層と記録層との間に作製されることから、結晶化促進作用をより効果的に発揮し、かつスループットを向上させることができる。

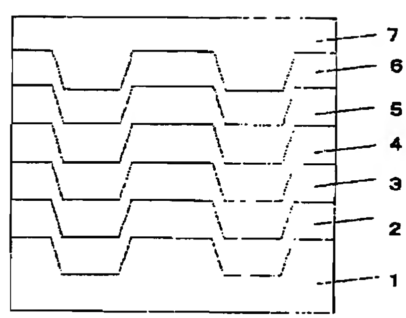
【図面の簡単な説明】

【図１】本発明による光情報記録媒体の構成例を模式的に示す断面図である。

【符号の説明】

1　基板
2　第１の誘電体層
3　結晶化促進層
4　記録層
5　第２の誘電体層
6　反射放熱層
7　有機環境保護層

【図１】



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